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Renesas Technology Corp.  
Customer Support Dept.  
April 1, 2003

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Keep safety first in your circuit designs!

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Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

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# TBB1010

## Twin Build in Biasing Circuit MOS FET IC VHF/VHF RF Amplifier

# RENESAS

ADE-208-1607B (Z)

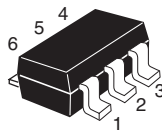
3rd. Edition  
Feb. 2003

### Features

- Small SMD package CMPAK-6 built in twin BBFET; To reduce using parts cost & PC board space.
- High  $|y_{fs}|=29\text{mS} \times 2$
- Suitable for World Standard Tuner RF amplifier.
- Very useful for total tuner cost reduction.
- Withstanding to ESD; Build in ESD absorbing diode. Withstand up to 200 V at  $C = 200 \text{ pF}$ ,  $R_s = 0$  conditions.
- Provide mini mold packages; CMPAK-6

### Outline

CMPAK-6



1. Drain(1)
2. Source
3. Drain(2)
4. Gate-1(2)
5. Gate-2
6. Gate-1(1)

- Notes:
1. Marking is "KM".
  2. TBB1010 is individual type number of HITACHI TWIN BBFET.

**Absolute Maximum Ratings**

(Ta = 25°C)

<b>Item</b>	<b>Symbol</b>	<b>Ratings</b>	<b>Unit</b>
Drain to source voltage	V <sub>DS</sub>	6	V
Gate1 to source voltage	V <sub>G1S</sub>	+6 -0	V
Gate2 to source voltage	V <sub>G2S</sub>	+6 -0	V
Drain current	I <sub>D</sub>	30	mA
Channel power dissipation	P <sub>ch</sub> <sup>*3</sup>	250	mW
Channel temperature	T <sub>ch</sub>	150	°C
Storage temperature	T <sub>stg</sub>	-55 to +150	°C

Notes: 3. Value on the glass epoxy board (50mm × 40mm × 1mm).

## Electrical Characteristics

( $T_a = 25^\circ\text{C}$ )

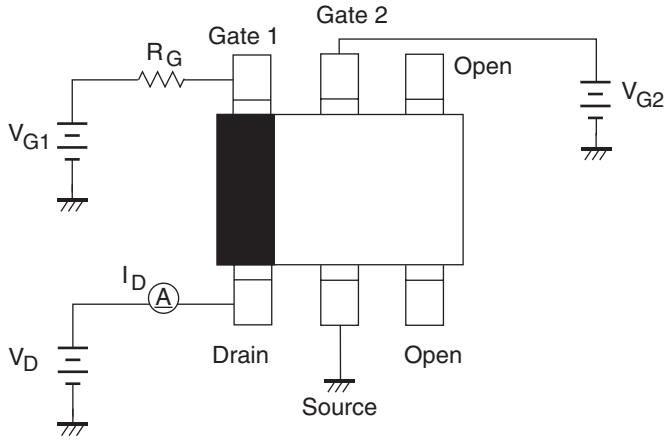
The below specification are applicable for FET1 and FET2 unit

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	6	—	—	V	$I_D = 200 \mu\text{A}$ , $V_{G1S} = V_{G2S} = 0$
Gate1 to source breakdown voltage	$V_{(BR)G1SS}$	+6	—	—	V	$I_{G1} = +10 \mu\text{A}$ , $V_{G2S} = V_{DS} = 0$
Gate2 to source breakdown voltage	$V_{(BR)G2SS}$	+6	—	—	V	$I_{G2} = +10 \mu\text{A}$ , $V_{G1S} = V_{DS} = 0$
Gate1 to source cutoff current	$I_{G1SS}$	—	—	+100	nA	$V_{G1S} = +5 \text{ V}$ , $V_{G2S} = V_{DS} = 0$
Gate2 to source cutoff current	$I_{G2SS}$	—	—	+100	nA	$V_{G2S} = +5 \text{ V}$ , $V_{G1S} = V_{DS} = 0$
Gate1 to source cutoff voltage	$V_{G1S(off)}$	0.6	—	1.1	V	$V_{DS} = 5 \text{ V}$ , $V_{G2S} = 4 \text{ V}$ , $I_D = 100 \mu\text{A}$
Gate2 to source cutoff voltage	$V_{G2S(off)}$	0.6	—	1.1	V	$V_{DS} = 5 \text{ V}$ , $V_{G1S} = 5 \text{ V}$ , $I_D = 100 \mu\text{A}$
Drain current	$I_{D(op)}$	12	16	20	mA	$V_{DS} = 5 \text{ V}$ , $V_{G1} = 5 \text{ V}$ $V_{G2S} = 4 \text{ V}$ , $R_G = 120 \text{ k}\Omega$
Forward transfer admittance	$ y_{fs} $	24	29	—	mS	$V_{DS} = 5 \text{ V}$ , $V_{G1} = 5 \text{ V}$ , $V_{G2S} = 4 \text{ V}$ $R_G = 120 \text{ k}\Omega$ , $f = 1 \text{ kHz}$
Input capacitance	$C_{iss}$	1.7	2.1	2.5	pF	$V_{DS} = 5 \text{ V}$ , $V_{G1} = 5 \text{ V}$
Output capacitance	$C_{oss}$	1.0	1.4	1.8	pF	$V_{G2S} = 4 \text{ V}$ , $R_G = 120 \text{ k}\Omega$
Reverse transfer capacitance	$C_{rss}$	—	0.03	0.05	pF	$f = 1 \text{ MHz}$
Power gain	PG	25	30	—	dB	$V_{DS} = V_{G1} = 5 \text{ V}$ , $V_{G2S} = 4 \text{ V}$
Noise figure	NF	—	1.1	1.8	dB	$R_G = 120 \text{ k}\Omega$ , $f = 200 \text{ MHz}$

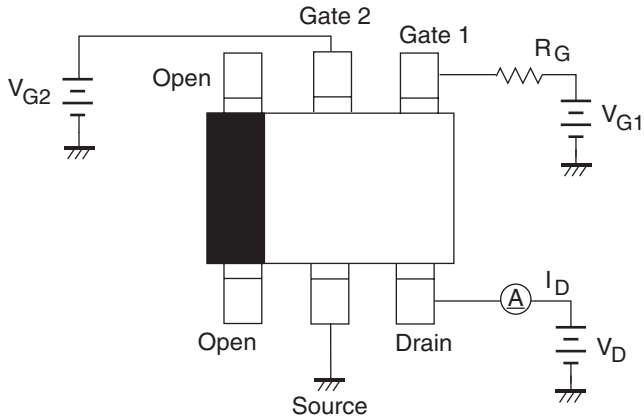
## Test Circuits

- DC Biasing Circuit for Operating Characteristic Items ( $I_{D(op)}$ ,  $|y_{fs}|$ ,  $C_{iss}$ ,  $C_{oss}$ ,  $C_{rss}$ ,  $NF$ ,  $PG$ )

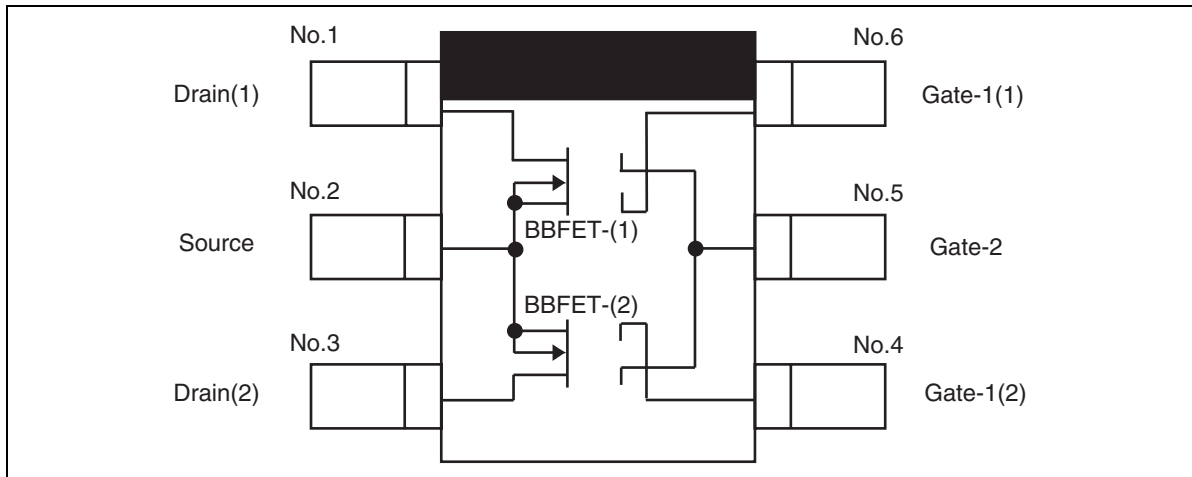
Measurement of FET1



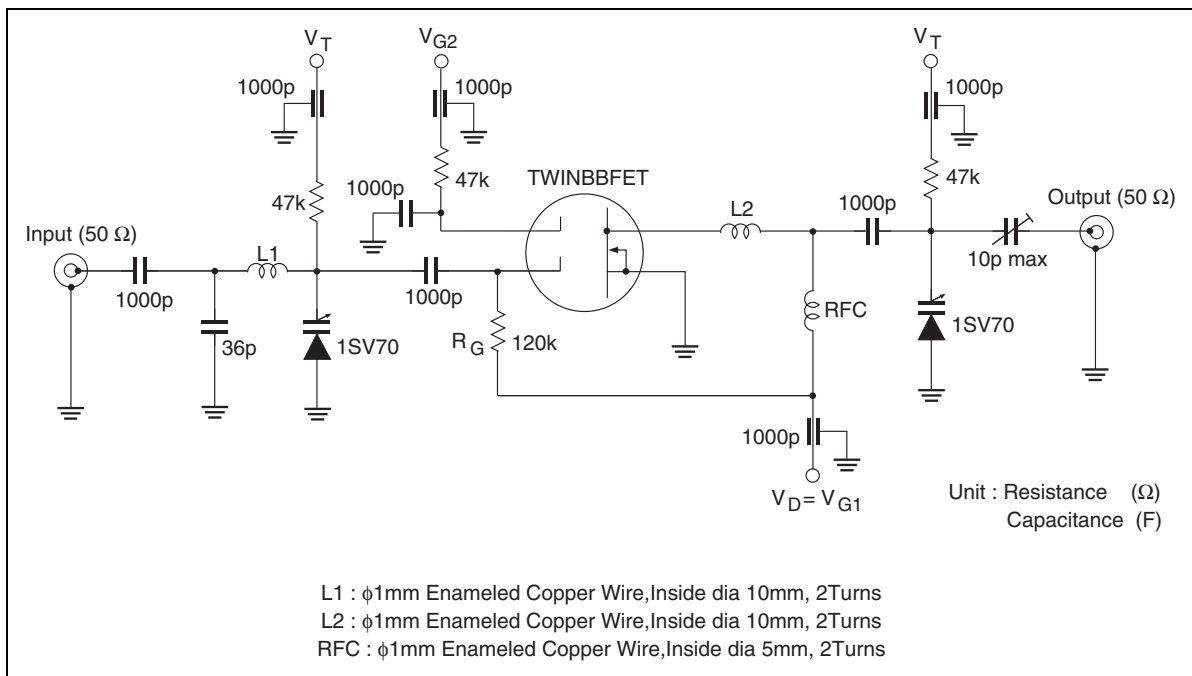
Measurement of FET2



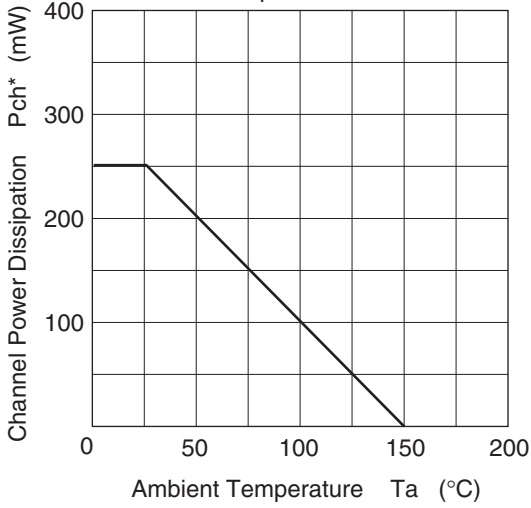
• Equivalent Circuit



• 200 MHz Power Gain, Noise Figure Test Circuit

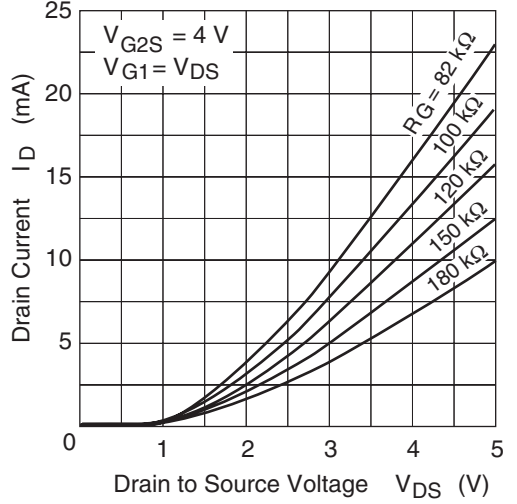


Maximum Channel Power Dissipation Curve

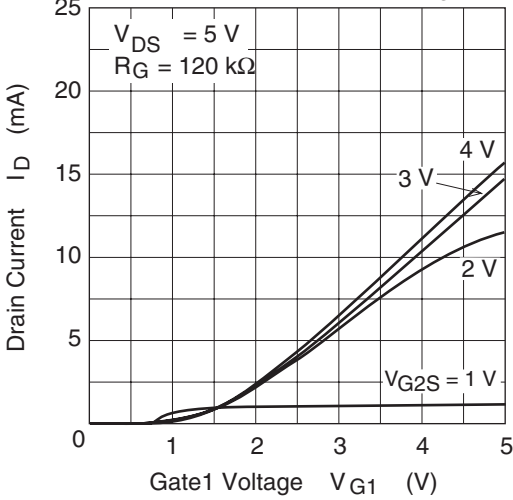


\* Value on the glass epoxy board (50mm × 40mm × 1mm)

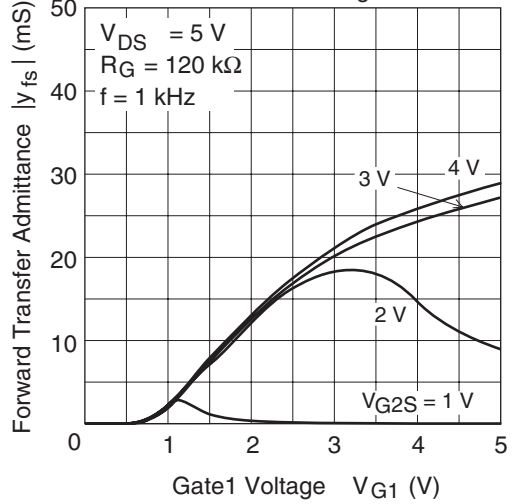
Typical Output Characteristics



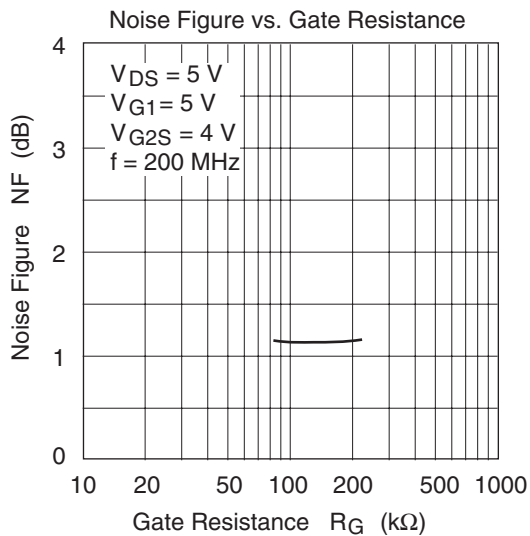
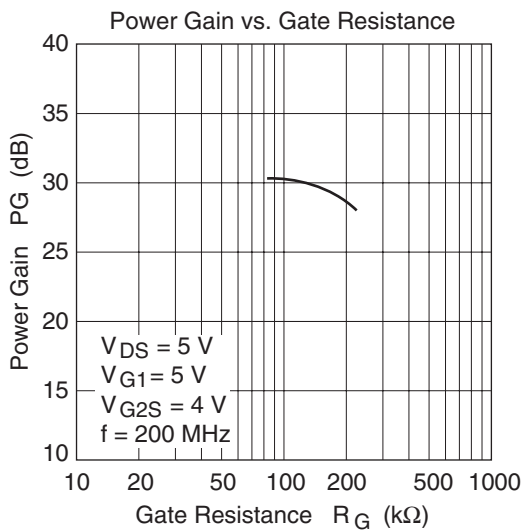
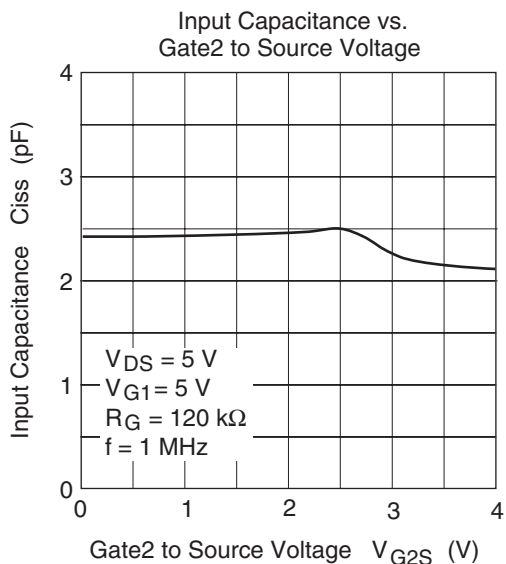
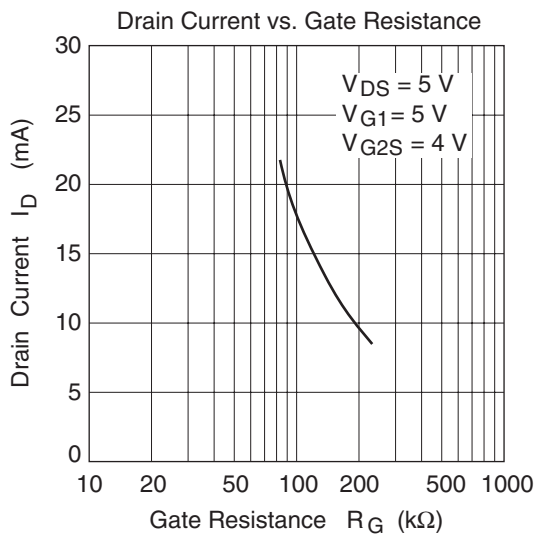
Drain Current vs. Gate1 Voltage

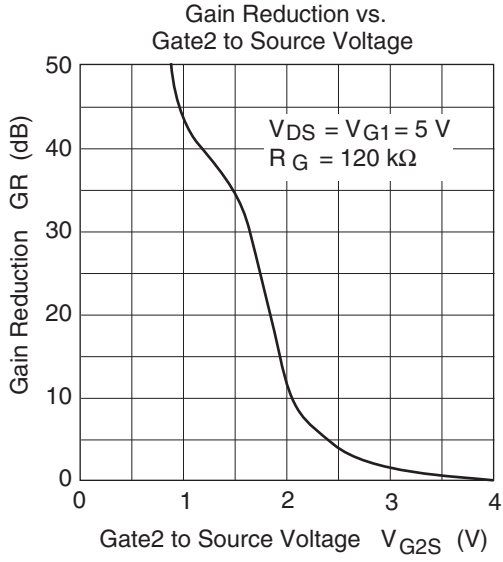


Forward Transfer Admittance vs. Gate1 Voltage





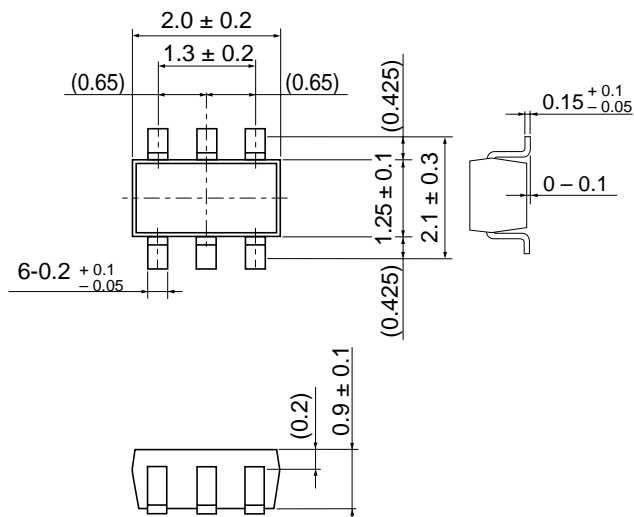




## Package Dimensions

As of July, 2002

Unit: mm



Hitachi Code	CMPAK-6
JEDEC	—
JEITA	Conforms
Mass (reference value)	0.006 g

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